

**FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT  
SCIENTIFIC ADVISORY PANEL  
OPEN MEETING  
OCTOBER 18-21, 2016**

**FIFRA SAP Website <https://www.epa.gov/sap>  
Docket Number: EPA-HQ-OPP-2016-0385**

**U.S. Environmental Protection Agency Conference Center  
Lobby Level One Potomac Yard (South Bldg.) 2777 S. Crystal Drive  
Arlington, VA 22202**

**FIFRA SAP Review of a Set of Scientific Issues being Evaluated by the  
Environmental Protection Agency (EPA) regarding EPA's evaluation of the  
Carcinogenic Potential of Glyphosate**

**TUESDAY, OCTOBER 18, 2016**

**Please note that all times are approximate (see note at end of agenda).**

- 9:00 AM Meeting Opening and Administrative Procedures** – Steven Knott, M.S.,  
Designated Federal Official, Office of Science Coordination and Policy, EPA
- 9:10 AM Introduction of Panel Members** – James McManaman, Ph.D., Chair of the  
FIFRA SAP
- 9:15 AM Welcome and Opening Remarks** – Jack Housenger, Director, Office of  
Pesticide Programs, EPA
- 9:30 AM Introduction** - Dana Vogel, Director, Health Effects Division, Office of Pesticide  
Programs, EPA
- 9:45 AM Overview of Glyphosate Registration and Carcinogenic Potential  
Evaluation**– Monique Perron, Sc.D., Health Effects Division, Office of Pesticide  
Programs, EPA
- 10:15 AM Systematic Review and Data Collection Methods**– Gregory Akerman, Ph.D.,  
Health Effects Division, Office of Pesticide Programs, EPA
- 10:45 AM Break**
- 11:00 AM Data Evaluation of Epidemiology Studies**– Monique Perron, Sc.D., Health  
Effects Division, Office of Pesticide Programs, EPA
- 12:00 PM Lunch**

**1:00 PM      Data Evaluation of Animal Carcinogenicity Studies** – Anwar Dunbar, Ph.D.,  
Health Effects Division, Office of Pesticide Programs, EPA

**2:00 PM      Data Evaluation of Genetic Toxicity** – Gregory Akerman, Ph.D., Health Effects  
Division, Office of Pesticide Programs, EPA

**3:00 PM      Break**

**3:15 PM      Data Integration and Weight of Evidence Analysis Across Multiple Lines of  
Evidence** – Monique Perron, Sc.D., Health Effects Division, Office of Pesticide  
Programs, EPA

**4:15 PM      Summary Presentation** – Monique Perron, Sc.D., Health Effects Division,  
Office of Pesticide Programs, EPA

**5:00 PM      Public Comments**

European Food Safety Authority (EFSA) – 45 minutes.....~5:45 PM

Daniele Court-Marques, MSPS

German Federal Institute for Risk Assessment (BfR) – 20 minutes.....~6:05 PM

Rudolf Pfeil, DVM

**6:00 PM      Adjournment**

**WEDNESDAY, OCTOBER 19, 2016**

U.S. Environmental Protection Agency Conference Center  
Lobby Level One Potomac Yard (South Bldg.) 2777 S. Crystal Drive  
Arlington, VA 22202

**Please note that all times are approximate (see note at end of agenda).**

**8:30 AM Meeting Opening and Administrative Procedures** – Steven Knott, M.S.,  
Designated Federal Official, Office of Science Coordination and Policy, EPA

**8:35 AM Introduction of Panel Members** – James McManaman, Ph.D., Chair of the  
FIFRA SAP

**8:40 AM Public Comments Continued**

Monsanto Company – 3 hours

Donna Farmer, Ph.D., Caroline Harris, Ph.D., John Acquavella, Ph.D., James  
Bus, Ph.D., Bhaskar Gollapudi, Ph.D., and Rick Reiss, Ph.D.

**10:30 AM Break**

**10:45 AM Public Comments Continued**

Monsanto Company Continued.....~11:55 AM

**12:00 PM Lunch**

**1:00 PM Public Comments Continued**

Nufarm Americas Inc. – 30 minutes.....~1:30 PM

James S. Bus Ph.D., DABT, Fellow ATS

BASF – 45 minutes.....~2:15 PM

Catherine Holmes, PhD

**2:15 PM Break**

**2:30 PM Public Comments Continued**

CropLife America – 1 hour and 10 minutes.....~3:40 PM

Janet Collins, PhD and Carol Burns, PhD

Virginians for Medical Freedom – 5 minutes.....~3:45 PM

Deborah Hommer

Center for Regulatory Effectiveness – 15 minutes.....~4:00 PM

Scott Slaughter

Dow AgroSciences – 30 minutes.....~4:30 PM

Sabitha Papineni, PhD

Dupont Crop Protection – 20 minutes.....4:50 PM

Wendelyn Jones, PhD

American Soybean Association – 5 minutes.....~4:55 PM

Kevin Hoyer

FMC Corporation – 20 minutes.....~5:15 PM

Andy Hedgecock

National Corn Growers Association – 5 minutes.....~5:20 PM

Chip Bowling

Food and Water Watch – 5 minutes.....~5:25 PM

Amanda Starbuck

Center for Food Safety – 15 minutes.....5:40 PM

Bill Freese

Valent USA/Sumitomo Chemical – 20 minutes.....~6:00 PM

Robert Hamilton, PhD

**6:00 PM      Adjournment**

**THURSDAY, OCTOBER 20, 2016**

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Lobby Level One Potomac Yard (South Bldg.) 2777 S. Crystal Drive  
Arlington, VA 22202

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**8:35 AM Introduction of Panel Members** – James McManaman, Ph.D., Chair of the  
FIFRA SAP

**8:40 AM Public Comments Continued**

Syngenta Crop Protection – 40 minutes.....~9:20 AM

Montague Dixon

Consumers Union – 5 minutes.....~9:25 AM

Michael Hansen, PhD

US Department of Agriculture – 5 minutes until about.....~9:30 AM

Sheryl H. Kunickis, Ph.D.

Moms Across America – 15 minutes.....~9:45 AM

Laura E. Mayer, Marghi Barnes, and Kathy Blum

The Immediate Life – 5 minutes.....~9:50 AM

Reverend Billy Talen

Beyond Pesticides – 5 minutes.....~9:55 AM

Annie D’Amato, Ph.D.

Walk-ins

**10:30 AM Break**

**10:45 AM Charge Questions to the Panel**

1. The agency has collected a multitude of studies that may inform the human carcinogenic potential of glyphosate through a systematic review of the open literature and toxicological databases for glyphosate and glyphosate salts as described in Section 2.0. Please comment on the agency's methods to collect references for this evaluation, including the completeness, transparency, and appropriateness of these methods. Please also comment on whether there are additional relevant studies that could inform the human carcinogenic potential of glyphosate that were not included in the current evaluation.

**Lead Discussant:** Laura C. Green, Ph.D., D.A.B.T.

**Associate Discussants:** Peter F. Infante, Dr.P.H.; Barbara L. Parsons, Ph.D.; and Daniel Zelterman, Ph.D.

2. As part of its analysis, the agency has considered 58 individual epidemiological studies investigating the potential for an association between glyphosate exposure and numerous cancer outcomes. Detailed study evaluations were performed to determine overall quality rankings for relevant studies. These evaluations took into consideration study characteristics, including study design, exposure assessment, outcome assessment, control for confounders, statistical analyses, and risk of bias. Twenty-three studies were considered informative with regard to the carcinogenic potential of glyphosate.
  - a. Please comment on the agency's review and evaluation process of relevant epidemiology studies to inform the human carcinogenic potential of glyphosate.

**Lead Discussant:** Peter F. Infante, Dr.P.H.

**Associate Discussants:** David A. Jett, Ph.D.; Kenneth Portier, Ph.D. and Luoping Zhang, Ph.D.

**12:00 PM Lunch**

**1:00 PM Charge Questions to the Panel Continued**

- b. Please comment on the strengths and limitations of the available studies to inform the association between glyphosate and solid tumors, leukemia, and Hodgkin lymphoma and the agency's conclusion regarding these cancer types described in Section 3.6.

**Lead Discussant:** Luoping Zhang, Ph.D.

**Associate Discussants:** Kenny Crump, Ph.D.; Laura C. Green, Ph.D., D.A.B.T.; and Peter F. Infante, Dr.P.H.

- c. Please comment on the strengths and limitations of the available studies to inform the association between glyphosate and multiple myeloma. Please comment on the agency's conclusion as described in Section 3.6

**Lead Discussant:** Peter F. Infante, Dr.P.H.

**Associate Discussants:** Kenny Crump, Ph.D.; Laura C. Green, Ph.D., D.A.B.T.; and Luoping Zhang, Ph.D.

- d. Please comment on the strengths and limitations of the available studies to inform the association between glyphosate and non-Hodgkin lymphoma (NHL). Please comment on the agency's conclusion as described in Section 3.6.

**Lead Discussant:** Luoping Zhang, Ph.D.

**Associate Discussants:** Kenny Crump, Ph.D.; Laura C. Green, Ph.D., D.A.B.T.; and Peter F. Infante, Dr.P.H.

**2:30 PM Break**

**2:45 PM Charge Questions to the Panel Continued**

3. The agency has followed the 2005 EPA Guidelines for Carcinogen Risk Assessment to evaluate laboratory animal carcinogenicity studies for glyphosate. As described in Sections 4.5 and 4.6, a total of 9 acceptable rat and 6 acceptable mouse carcinogenicity studies were evaluated and considered in the weight-of-evidence analysis. Consistent with the 2005 Guidelines, this analysis took into consideration statistical evidence of a dose-response, the occurrence of corroborating pre-neoplastic lesions or related non-neoplastic lesions to support tumor findings, evidence of progression to malignancy, concurrent and historical control information, and statistical and biological significance of increase tumor incidence, as well as the reproducibility of tumor findings.
- a. Please comment on the agency's review and evaluation process of relevant laboratory animal carcinogenicity studies to inform the human carcinogenic potential of glyphosate.
- Lead Discussant:** Aramandla Ramesh, Ph.D.  
**Associate Discussants:** Laura C. Green, Ph.D., D.A.B.T.; James McManaman, Ph.D.; and Sonya K. Sobrian, Ph.D.
- b. For some of the available animal studies, statistically significant trends in tumor incidence were observed with a lack of statistically significant pairwise comparisons when adjusted for multiple comparisons<sup>1</sup>. Please comment on the agency's methodology and interpretation of statistical analyses to evaluate a linear dose-response (trend test) and increased tumor incidence as compared to controls (pairwise comparisons).

**Lead Discussant:** Daniel Zeltermann, Ph.D.

**Associate Discussants:** Kenny Crump, Ph.D.; Kenneth Portier, Ph.D.; and Aramandla Ramesh, Ph.D.

- c. Unusually low incidences in concurrent controls in comparison with historical controls were noted in Lankas (1981), Stout and Rueckerf (1990), and Wood et al. (2009b) and considered as part of the weight-of-evidence for tumor findings. Please comment on the agency's use and interpretation of historical control data as a line of evidence to inform the statistical and biological significance of tumor findings for glyphosate.

**Lead Discussant:** Kenny Crump, Ph.D.

**Associate Discussants:** Kenneth Portier, Ph.D.; and Aramandla Ramesh, Ph.D. Daniel Zeltermann, Ph.D.

- d. Please comment on the agency's conclusion that there is an absence of corroborating preneoplastic lesions or related non-neoplastic lesions. Please also comment on the agency's conclusion that there is a lack of progression to malignancy to support tumor findings.

**Lead Discussant:** Barbara L. Parsons, Ph.D.

**Associate Discussants:** Kristi Muldoon Jacobs, Ph.D.; Aramandla Ramesh, Ph.D.; and Sonya K. Sobrian, Ph.D.

- e. In the case of glyphosate, there are multiple carcinogenicity studies available for the evaluation of carcinogenic potential. The agency looked across all of the studies and found that tumor findings were not consistent or reproduced in other studies conducted in the same species and strain at similar or higher doses. Please comment on the interpretation of conflicting evidence and reproducibility for these studies.

**Lead Discussant:** Laura C. Green, Ph.D., D.A.B.T.

**Associate Discussants:** Kenneth Portier, Ph.D.; and Aramandla Ramesh, Ph.D.; Daniel Zeltermann, Ph.D.

**5:15 PM      Adjournment**



**FRIDAY, OCTOBER 21, 2016**

U.S. Environmental Protection Agency Conference Center  
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**Please note that all times are approximate (see note at end of agenda).**

**9:00 AM Meeting Opening and Administrative Procedures** – Steven Knott, M.S.,  
Designated Federal Official, Office of Science Coordination and Policy, EPA

**9:05 AM Introduction of Panel Members** – James McManaman, Ph.D., Chair of the  
FIFRA SAP

**9:10 AM Charge Questions to the Panel Continued**

- f. As described in Section 1.4, high-end estimates of exposure based on the currently registered uses for glyphosate in the United States have been calculated as 0.47 mg/kg/day and 7 mg/kg/day for potential residential and occupational exposures, respectively. As a result, the agency concluded that tumors observed at high-doses (approaching or exceeding 1,000 mg/kg/day) following glyphosate administration are not relevant for human health risk assessment. Please comment on the conclusions regarding the relevance of high-dose tumors to the human health risk assessment for glyphosate.

**Lead Discussant:** Kristi Muldoon Jacobs, Ph.D.

**Associate Discussants:** Laura C. Green, Ph.D., D.A.B.T.; Barbara L. Parsons, Ph.D.; and Aramandla Ramesh, Ph.D.

- g. Please comment on the strengths and uncertainties associated with the agency's overall weight-of-evidence and conclusions based on the available animal carcinogenicity studies, as described in Section 4.8.

**Lead Discussant:** Aramandla Ramesh, Ph.D.

**Associate Discussants:** Kenny Crump, Ph.D.; Kristi Muldoon Jacobs, Ph.D.; and Kenneth Portier, Ph.D.

**10:15 AM Break**

**10:30 AM Charge Questions to the Panel Continued**

4. As part of its analysis, the agency has considered almost 200 assays investigating the genotoxic potential of glyphosate. Of these, 107 were performed with the active ingredient glyphosate. These included in vitro and in vivo studies from the open literature, as well as studies submitted to the agency that were conducted according to Office of Chemical Safety and Pollution Prevention (OCSPP)/ Organization for

Economic Cooperation and Development (OECD) guidelines. Non-mammalian studies were excluded from this analysis unless the assays were generally recognized to inform the human carcinogenic potential of glyphosate (e.g., bacterial reverse mutation assays). Studies evaluated genotoxic endpoints, such as gene mutations in bacteria and mammalian cells, chromosomal aberrations, micronuclei formation, and other assays measuring DNA damage.

- a. Please comment on the agency's review and evaluation process of relevant genotoxicity studies to inform the human carcinogenic potential of glyphosate, including the decision to exclude non-mammalian studies (e.g., reptiles, plants, worms, fish), except those generally recognized to inform human carcinogenic potential.

**Lead Discussant:** Barbara L. Parsons, Ph.D.

**Associate Discussants:** Kristi Muldoon Jacobs, Ph.D.; Joseph Shaw, Ph.D.; and Luoping Zhang, Ph.D.

- b. Consistent with the OECD guidance (2015), in vivo findings in genetic toxicology testing are generally considered as having a greater relevance to humans than in vitro findings. Consistent with the 2005 Cancer Guidelines, all available data were considered in the weight-of-evidence evaluation of the genotoxic potential for glyphosate. The relevant studies are summarized in Tables 5.1-5.7. Please comment on the agency's approach for evaluating the genotoxicity data.

**Lead Discussant:** Kristi Muldoon Jacobs, Ph.D.

**Associate Discussants:** Barbara L. Parsons, Ph.D.; Joseph Shaw, Ph.D.; and Luoping Zhang, Ph.D.

- c. As described in Section 1.4, oral exposure is considered the primary route of concern for glyphosate and high-end estimates of exposure range from 0.47-7 mg/kg/day. Please comment on the human health relevance of the genotoxicity findings with respect to the doses where effects were observed and the route of administration.

**Lead Discussant:** Barbara L. Parsons, Ph.D.

**Associate Discussants:** Kristi Muldoon Jacobs, Ph.D.; Joseph Shaw, Ph.D.; and Luoping Zhang, Ph.D.

**12:00 PM      Lunch**

**1:00 PM      Charge Questions to the Panel Continued**

- d. Please comment on the strengths and uncertainties associated with the agency's overall weight-of-evidence and conclusions based on the available genotoxicity studies, as described in Section 5.7.

**Lead Discussant:** Kristi Muldoon Jacobs, Ph.D.

**Associate Discussants:** Barbara L. Parsons, Ph.D.; Joseph Shaw, Ph.D.; and Luoping Zhang, Ph.D.

5. The modified Bradford Hill criteria were used to evaluate multiple lines of evidence using such concepts as strength, consistency, dose response, temporal concordance, and biological plausibility. In accordance with the 2005 Cancer Guidelines, the agency used a weight-of-evidence analysis to characterize the human carcinogenic potential of glyphosate and determine which cancer descriptor is supported by the data. The agency has described the strengths and uncertainties associated with the choice of various cancer descriptors with a focus on “suggestive evidence of carcinogenic potential” and “not likely to be carcinogenic to humans”. Please comment on the completeness, transparency, and scientific quality of the agency’s characterization of the carcinogenic potential.

**Lead Discussant:** Kenneth Portier, Ph.D.

**Associate Discussants:** Laura C. Green, Ph.D., D.A.B.T.; Peter F. Infante, Dr.P.H.; Kristi Muldoon Jacobs, Ph.D.; Barbara L. Parsons, Ph.D.; and Daniel Zeltermann, Ph.D.

## **2:00 PM      Adjournment**

*As noted above, please be advised that agenda times are approximate. For further information, please contact the Designated Federal Official for this meeting, Mr. Steven Knott, via telephone: (202) 564-0103 or email:knott.steven@epa.gov.*